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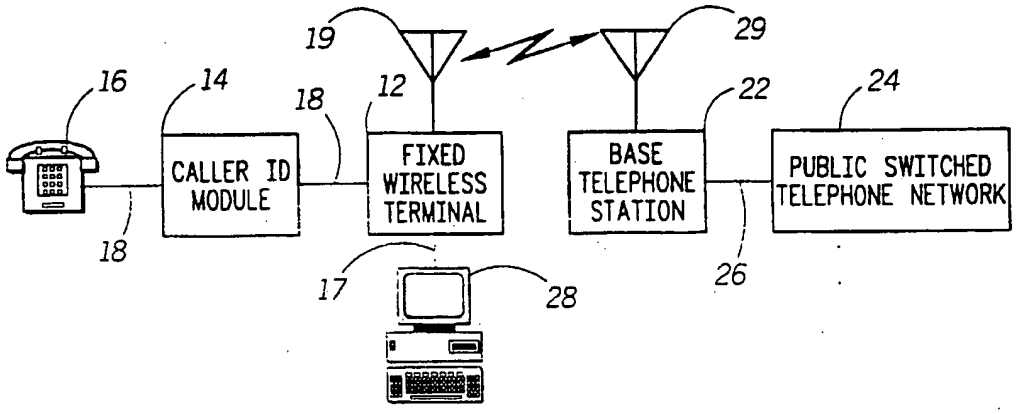
(54) Title: METHOD AND APPARATUS FOR DISPLAYING SHORT MESSAGE SERVICE MESSAGES IN A FIXED WIRELESS TERMINAL



(57) Abstract: A method and apparatus for displaying short message service messages from a fixed wireless terminal (200) operating in a wireless local loop. The fixed wireless terminal (200) has a transceiver (210) and a call processor (208) that establish a wireless local loop by the connection of an ordinary wireline telephone (220) to fixed wireless terminal (200). A standard caller ID module (222) conveniently and inexpensively provides short message service information to the user, short message service processor (212) within fixed wireless terminal (200). Short message service information may then be reported on the display or by tones generated in the earpiece of the telephone. Alternatively, the short message service information may be reported via an audio speaker coupled to the FWT, via a digital data device coupled to the FWT, or via a display capable peripheral that is able to wirelessly communicate with the FWT.

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METHOD AND APPARATUS FOR DISPLAYING SHORT MESSAGE SERVICE MESSAGES IN A FIXED WIRELESS TERMINAL

Field of the Invention

This invention is related in general to wireless communication systems and, more particularly, to an improved method and apparatus for displaying short message service messages from a fixed wireless terminal operating in a wireless local loop.

Background of the Invention

Many cellular telephones used in a wireless telephone system include a visual interface which displays status information to the user, such as the unit's ability to access a local cell site. Other status information about the cellular telephone itself may also be reported to the user via a visual interface and display on the cellular telephone. In addition, with the introduction of the Global System for Mobile (GSM) communications standard, the Code Division Multiple Access (CDMA) communications standard, etc., a number of other special subscriber services are available to enable mobile subscribers to not only communicate data which represent voice, but also other unstructured data over the serving Public Land Mobile Network (PLMN) or Public Switched Telephone Network (PSTN). Messages like Short Message Service (SMS) messages are utilized to communicate text data between a serving Mobile Switching Center (MSC) and a mobile station. However, the use of an ordinary wireline telephone connected to a fixed wireless terminal (FWT) in a wireless local loop (WLL) may lack such a visual display capability, but could also benefit from the ability to display the SMS messages.

In a wireless local loop system, the fixed wireless terminal may be mounted in a building or residence in a location that is not easily

accessible for obtaining short message service information. Moreover, the display of Short Message Service (SMS) information or messages received by the fixed wireless terminal is currently not available with the wireline telephone either on hook or off hook.

In view of the foregoing it is apparent that a need exists for an improved method and apparatus for displaying Short Message Service messages in a fixed wireless terminal.

Summary of the Invention

In basic operation, a fixed wireless terminal having transceiver and call processing means establishes a wireless local loop by the connection of an ordinary wireline telephone to the FWT. A data input device such as a personal computer or a hand held computer may also be connected to the FWT. This provides the user with an RF telephone link to a cellular telephone system for transmission of voice or data communications. In a preferred embodiment, a standard caller ID module, either in the telephone or in line between the fixed wireless terminal and the telephone, conveniently and inexpensively provides the means to provide short message service information to the user. Such short message service information may be obtained from a short message service processor within the fixed wireless terminal. The short message service information may then be reported on the display and an indication of the reception of a short message service message may be by tones generated in the earpiece of the telephone. A signaling generator within the telephone line interface of the fixed wireless terminal encodes the information provided by the short message service processor into an FSK signal according to the generic, asynchronous caller ID protocol, or, alternatively, the signaling generator may generate audible tones for signaling through the telephone earpiece or control signals to produce a sequence of ringing signals on the telephone ringer, or may produce a visual display. In addition, the

signaling generator may generate a signal to be output on any wireless protocol.

In an alternate embodiment, a fixed wireless terminal having transceiver and call processing means, and further having short message service processing, signaling generator, and telephone line interface means, also includes the caller ID interface, decoding, and display means. This embodiment requires no other apparatus besides coupling an ordinary wireline telephone to the fixed wireless terminal via a telephone line. An ordinary data input/output device such as a personal computer, personal digital assistant (PDA), etc., may also be coupled to the fixed wireless terminal via a data line interface means, thereby allowing the short message service message to be displayed on the personal computer, PDA, etc. The fixed wireless terminal may provide short message service information to be read out on a caller ID display built into the FWT. Alternatively, an indication of the short message service information reception may be provided via audible signals transmitted to the telephone.

Brief Description of the Drawings

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objects, and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

FIG. 1 shows a wireless local loop system communicating with the public switched telephone network via a wireless communication channel;

FIG. 2 shows a functional block diagram of a wireless local loop system in accordance with the present invention;

FIG. 3 shows a functional block diagram of the signaling generator

portion of the fixed wireless terminal of **FIG. 2**; and

FIG. 4 shows a functional flow diagram of a fixed wireless terminal system operating according to the present invention.

Detailed Description of the Invention

In a preferred embodiment, the present invention utilizes a caller ID protocol. The caller ID protocol will provide a generic asynchronous voice band protocol usable for displaying short message service information such as pages, voice mail notifications, and other types of text messages on caller ID equipment both before call origination and during an active call.

FIG. 1 illustrates a wireless local loop (WLL) system **10** communicating with the public switched telephone network (PSTN) **20** over a wireless communication channel. WLL **10** includes fixed wireless terminal (FWT) **12** coupled to antenna **19** and telephone line **18**. Also coupled to telephone line **18** are caller ID module **14** and telephone **16**. Personal computer or other peripheral device **28** is coupled to FWT **12** via data line **17**. Connections to telephone line **18** may be made using standard connectors (not shown) such as those known by the designation RJ-11, and the like. Connections to data line **17** may be made using standard connectors (not shown) such as those known by the designation RJ-45, USB, and the like. Caller ID module **14** is a typical unit available to consumers and is equipped with a display for displaying calling number and perhaps calling name information, or other similarly encoded information.

Base Telephone Station (BTS) **22**, with its associated antenna **29**, is shown coupled to PSTN **24** via signal path **26** to illustrate the environment in which WLL **10** operates. These units, BTS **22**, antenna **29**, signal path **26** and PSTN **24**, are well known in the art and will not be described further herein. Similarly, other standard units in **FIG. 1**, such as telephone **16**, personal computer **28**, caller ID module **14**, telephone line **18**, data line **17**, and antenna **19**, are standard, well-known items, which will not be described further.

A data transmission path to caller ID module **14** may be established over telephone line **18** when fixed wireless terminal **12** is in an idle state prior to call origination and telephone **16** is on-hook. Similarly, WLL system **10** of **FIG. 1** may be used to establish a data transmission path to caller ID module **14** during a call, while fixed wireless terminal **12** is in a conversation state, and telephone **16** is either on or off-hook. In the preferred embodiment, the conversation state of fixed wireless terminal **12** is one of an analog facsimile call, a digital data call, and a voice call. Short message service information may also be reported with other output indications in the form of speech signals generated in fixed wireless terminal **12** and reproduced in the earpiece of telephone **16** or via external speaker. Other output signals in the form of ringing signals or audible tones may also be generated in fixed wireless terminal and coupled to telephone **16** to report reception of short message service information.

FIG. 2 shows a functional block diagram of a WLL system embodying the present invention. As illustrated, fixed wireless terminal **200** is coupled to an RF communications channel (not shown) by antenna **214**, and to telephone line **221** by coupling **202**. Coupling **202**, which may serve the purpose of providing a local loop interface, may illustratively be an RJ-11 connector and a local loop electrical circuit. Similarly, telephone line **221** may be coupled to caller ID module **222** and to telephone **220** using standard telephone line cabling and connectors (connectors not

shown), such as the aforementioned RJ-11 type connector. In addition, fixed wireless terminal **200** is coupled to data line **225** by coupling **227**. Similarly, data line **225** may be coupled to personal computer or other peripheral **229** using standard cabling and connectors. Similarly, output signal path **250** may be coupled to a wireless interface **252**, thereby allowing FWT **200** to wirelessly communicate with any wireless compatible, display capable peripheral. In addition, output signal path **254** may be coupled to audio coupling **256**, thereby enabling FWT **200** to be coupled to an audio output device such as a speaker. Antenna **214**, coupling **202**, coupling **227**, and the other connectors are well known in the art and will not be further described.

In fixed wireless terminal **200** shown in **FIG. 2**, transceiver **210** and call processor **208**, coupled via path **207**, are well known elements of wireless cellular telephones. The functions of call processor **208** include establishing and maintaining communication with base telephone station (BTS) **22**, initiating and terminating a call, encoding and decoding voice and data, conforming to the selected multiple access protocol, and other similar functions typically performed in a subscriber unit in a cellular communications system. As there are several types of wireless telephone technologies in current use, these will not be described further because such details are well known to persons skilled in the art. By way of example, the present invention may be implemented in a CDMA (Code Division Multiple Access) fixed wireless terminal. However the invention is not limited to any particular form of multiple access or spectrum utilization technology.

As shown, call processor **208** includes short message service information **218**. Such short message service information may be stored in memory or registers or other storage devices.

Returning to **FIG. 2**, the signals conducted along path **207** may accordingly include voice or data signals, control signals, and the like.

Voice path 201 illustrates the bi-directional coupling of the voice, data, and control signals between the call processor 208 and coupling 202. Similarly, path 240 illustrates the bi-directional coupling of the voice, data, and control signals between the call processor 208 and coupling 227. Path 252 illustrates the bi-directional coupling of voice, data, and control signals between call processor 208 and interface or coupling 252. Path 254 illustrates the coupling of the voice and control signals between call processor 208 and coupling 256.

Also connected between coupling 202 and call processor 208 is dialing decoder 204 for detecting and decoding dual-tone-multi-frequency (DTMF) or pulse dialing signals received by fixed wireless terminal 200 on telephone line 221. Dialing signals are coupled to dialing decoder 204 along path 203 and decoded dialing data is coupled to call processor 208 along path 205. In some embodiments dialing decoder 204 may be implemented as part of call processor 208, especially if call processor 208 is largely implemented in software on a digital signal processor.

Call processor 208 is further coupled to telephone line 221 via data signal path 213, signaling generator 206, output signal path 209, and coupling 202. Data sent by call processor 208 or short message service processor 212, to be described later, are encoded for modulation in signaling generator 206 and provided as output signals for display or other reporting on telephone line 221, data line 225, signal path 250, and signal path 254.

Proceeding further with the description of FIG. 2, short message service processor 212 is shown coupling transceiver 210 to signaling generator 206 along signal path 219 and signal path 215. Short message service processor 212 also interacts with call processor 208 along bi-directional signal path 217.

Finally, dialing decoder 204 is also coupled to short message

service processor 212 via signal path 211. Short message service processor 212 performs a number of functions under the control of call processor 208. These functions include, but are not limited to, monitoring and storing certain call processing parameters utilized during set up, reception and transmission of communication with another station.

With reference now to FIG. 3, there is depicted one implementation of signaling generator 206 as it may be used in the present invention. In general, signaling generator 206 has character or tone generation and modulation functions, depending on the particular fixed wireless terminal 200 chosen for use with the present invention. In some embodiments several character or tone generator blocks may be required. For example, in FIG. 3, signaling generator 206 includes caller ID character generator 234 and modulator 230, in addition to primary character generator 232. Signal paths 213, 215, 231, 233 and 209 are shown interconnecting the functional blocks as shown in FIG. 3. Signaling generator 206 may illustratively include an ASCII character generator, a signaling tone generator, a universal asynchronous receiver/transmitter (UART) or other device for changing the form of digital data for modulation and coupling to the telephone line 221 of FIG. 2. Signaling generator 206 may also generate ringing signals. The foregoing embodiments described for FIG. 3 are provided for illustration and should not be understood as limiting alternative implementations as will be apparent to those skilled in the art.

FIG. 4, which shows a functional flow diagram of a WLL system operating according to the present invention, will next be described in conjunction with the apparatus illustrated in FIGs. 2 and 3. After entering the process flow at block 402, flow proceeds to decision block 403, where a determination is made whether a short message service message has been received. If not, then flow reverts back to the start. If a short message service message has been received, then flow proceeds to decision block 404, where a determination is made whether the FWT has a call in

progress. If a call is not in progress, then flow proceeds to block **416** as described below. If a call is in progress, then at decision block **406**, a determination is made whether the FWT is receiving an incoming call. The incoming call may contain calling party information comprising a Flash with Information message including caller ID. However, it will be appreciated by those skilled in the art that any proprietary message on the forward link including calling party information may be used.

If the FWT is not receiving an incoming call, then flow proceeds to block **416**. If the FWT is receiving an incoming call, then flow proceeds to decision block **408**, where a determination is made whether the FWT is in a data call. If not, then flow proceeds to decision block **410**, where a determination is made whether the FWT is in a voice call. If not, then flow proceeds to decision block **412**, where a determination is made whether the FWT is in a fax call. If not, then flow reverts back to the start. It will be appreciated by those skilled in the art that decision blocks **408**, **410**, and **412** are representative of checks being made for all defined service options. If the FWT is in a data call at step **408**, or in a voice call at step **410**, then flow proceeds to block **416**, which will be described in greater detail below. If the FWT is in a fax call at step **412**, then flow proceeds to decision block **414**, where a determination is made whether the fax transmission is idle, for example between pages, between blank lines, at the end of a line, etc. If the fax transmission is not idle, then flow reverts back to decision block **412**. If the fax transmission is idle, then flow proceeds to block **416**, where the step of decoding the short message service data is performed. The short message service information is then encoded or formatted, preferably as described in ANSI/UL STD 1459 (i.e. caller ID protocol) as shown at block **418**, for reporting via coupling **202**. Next, an output signal is generated at block **420** and such output signal is coupled to the telephone line, as illustrated at block **422**.

In formatting process step **418**, short message service information is

parsed and then formatted for display as a caller ID signal or reporting indication of reception of a short service message via audible signals. In process step 420, signaling generator 206 in FIG. 3 generates an output signal by encoding and modulating the formatted short message service information into character data or display data, or audible reporting signals, for transmission along telephone line 221, as shown in FIG. 2. Alternatively, speech synthesizer 260 within signaling generator 206 in FIG. 3 generates an output signal by encoding and modulating the formatted short message service information into character data or display data, or audible reporting signals, for transmission along signal path 254 as shown in FIG. 2. In addition, wireless modulator 262 within signaling generator 206 in FIG. 3 generates an output signal by encoding and modulating the formatted short message service information into a signal compatible with a wireless protocol for transmission along signal path 250 as shown in FIG. 2. In addition, call processor 208 generates an output signal by encoding and modulating the formatted short message service information into serial data for transmission along data line 225 as shown in FIG. 2.

The foregoing description of a preferred embodiment of the invention has been presented for the purpose of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed. Modifications or variations are possible in light of the above teachings. The embodiment was chosen and described to provide the best illustration of the principles of the invention and its practical application, and to enable one of ordinary skill in the art to utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated. All such modifications and variations are within the scope of the invention as determined by the appended claims when interpreted in accordance with the breadth to which they are fairly, legally, and equitably entitled.

Claims

What is claimed is:

1. A fixed wireless terminal comprising:

a transceiver;

a call processor coupled to the transceiver;

a telephone line coupling coupled to the call processor;

a short message service processor coupled to the call processor; and

a signaling generator coupled to the short message service processor and the telephone line coupling, the signaling generator adapted to generate an output signal based upon short message service information received from the short message service processor.

2. The fixed wireless terminal of claim 1, wherein the signaling generator comprises means for activating an audio/visual indicator.

3. The fixed wireless terminal of claim 2, wherein the signaling generator includes one of a caller identification signaling generator, an audio signal generator, a telephone ringer signal generator, and a display.

4. The fixed wireless terminal of claim 3 wherein the audio signal generator further includes a speech synthesizer.

5. The fixed wireless terminal of claim 1, including one of a data line coupling, an audio coupling, and a wireless coupling, coupled to the call processor.

6. The fixed wireless terminal of claim 1, wherein the telephone line coupling further includes an RJ-11 type connector and a local loop electrical interface.

7. A method for displaying short message service information in a fixed wireless terminal having a telephone line coupling, the method comprising the steps of:

receiving a short message service message;

generating a short message service signal adapted to be output on one of a caller identification unit, a peripheral data device, a wireless display unit, and a speaker; and

coupling the short message service signal to one of a telephone line coupling, a data line coupling, an audio coupling, and a wireless coupling.

8. A method as recited in claim 7, including the steps of:

determining whether the fixed wireless terminal had a call in progress prior to receiving the short message service message; and

ascertaining whether the call in progress is one of a data call, a voice call, and a facsimile call.

9. A method as recited in claim 8, wherein the step of ascertaining includes the step of determining whether a facsimile transmission is idle.

10. A method as recited in claim 7, wherein the step of generating a short message service output signal further includes generating a short message service output signal that can be heard using a telephone coupled to the telephone line coupling.

11. A method as recited in claim 10, wherein the step of generating a short message service output signal that can be heard using a telephone coupled to the telephone line coupling further includes one of

generating coded sequences of audio tones;

generating coded sequences of ringer signals; and

generating synthesized voice signals.

12. A system for displaying short message service information in a fixed wireless terminal having a telephone line coupling, the system comprising:

means for receiving a short message service message;

means for generating a short message service signal adapted to be output on one of a caller identification unit, a peripheral data device, a wireless display unit, and a speaker; and

means for coupling the short message service signal to one of a telephone line coupling, a data line coupling, an audio coupling, and a wireless coupling.

13. A method as recited in claim 12, including the steps of:

means for determining whether the fixed wireless terminal had a call in progress prior to receiving the short message service message; and

means for ascertaining whether the call in progress is one of a data call, a voice call, and a facsimile call.

14. A method as recited in claim 13, wherein the step of ascertaining includes the step of determining whether a facsimile transmission is idle.

15. A method as recited in claim 12, wherein the step of generating a short message service signal further includes generating a short message service signal that can be heard using a telephone coupled to the telephone line coupling.

16. A method as recited in claim 15, wherein the step of generating a short message service output signal that can be heard using a telephone coupled to the telephone line coupling further includes one of

generating coded sequences of audio tones;

generating coded sequences of ringer signals; and

generating synthesized voice signals.

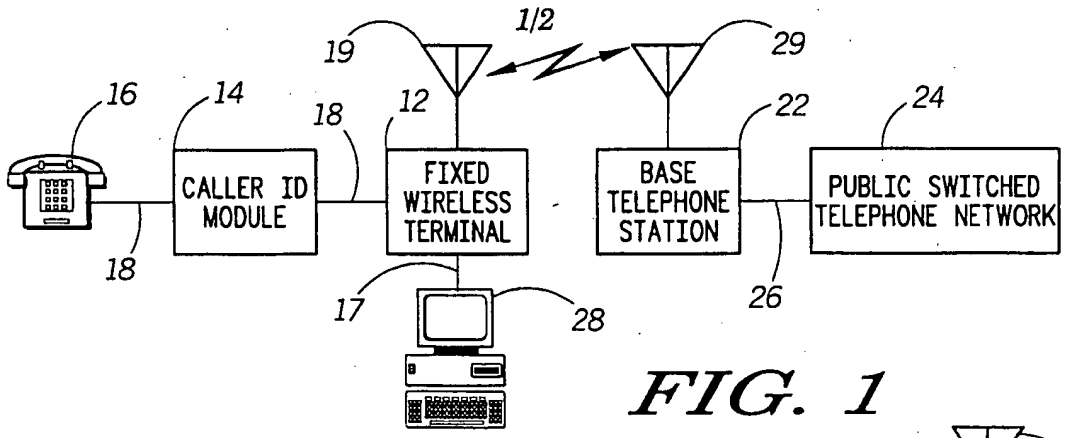

FIG. 1

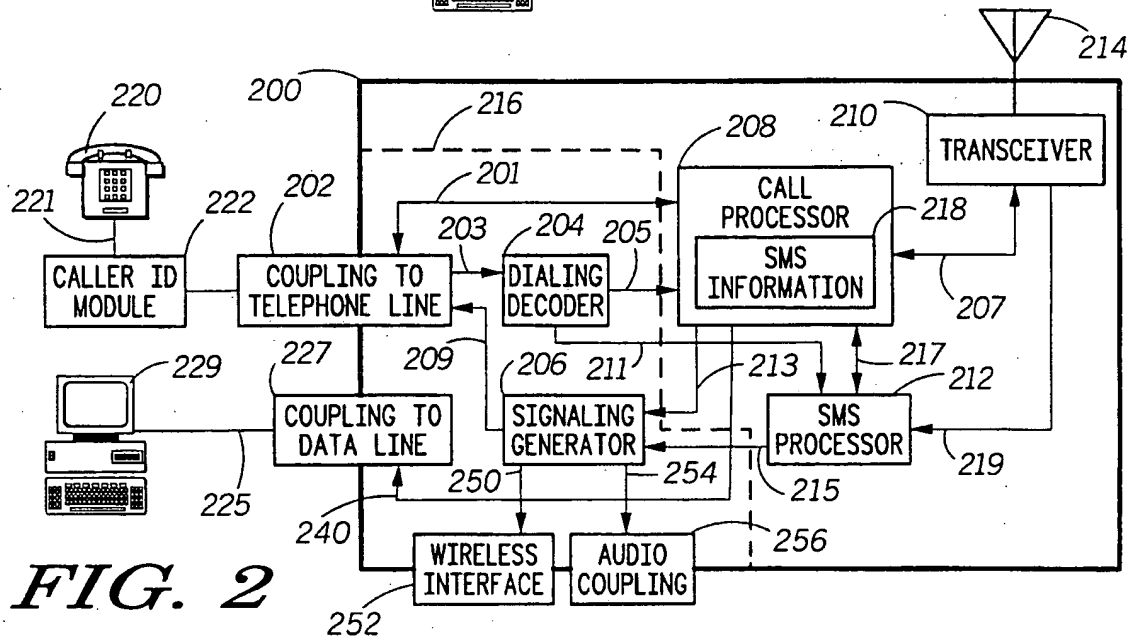

FIG. 2

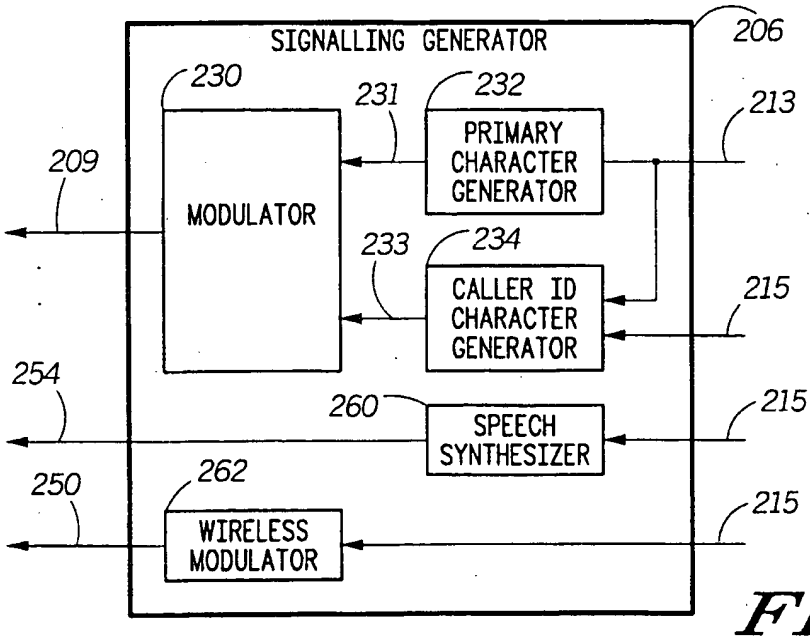

FIG. 3

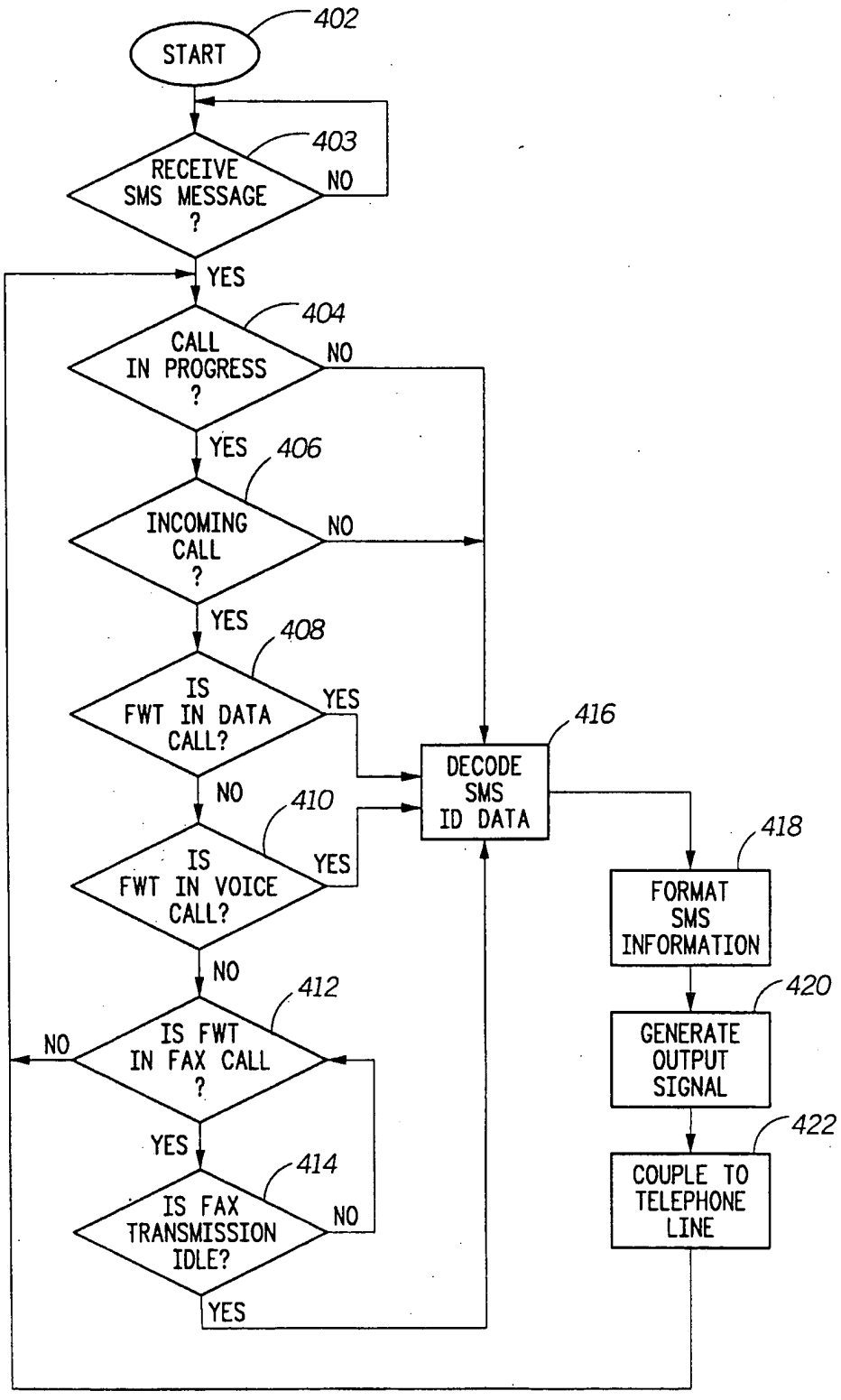
402
START
403
RECEIVE SMS MESSAGE ?
NO
YES
404
CALL IN PROGRESS ?
NO
YES
406
INCOMING CALL ?
NO
YES
408
IS FWT IN DATA CALL?
YES
NO
410
IS FWT IN VOICE CALL?
YES
NO
412
IS FWT IN FAX CALL ?
NO
YES
414
IS FAX TRANSMISSION IDLE?
NO
YES
416
DECODE SMS ID DATA
418
FORMAT SMS INFORMATION
420
GENERATE OUTPUT SIGNAL
422
COUPLE TO TELEPHONE LINE

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/33434

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : H04Q 7/32,720,7/38
US CL : 455/466,550,556,557,564,414,403424,425,517

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 455/466,550,556,557,564,414,403424,425,517

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EAST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,953,675 A (RABINA et al.) 14 September 1999, col. 2 lines 25-41, col. 3 lines 60-66, fig. 4 number 410, col. 4 lines 5-28.	7,12
—		----------
Y		1-6,8-11,13-16
Y,P	US 6,032,039 A (KAPLAN) 29 February 2000, fig. 1 numbers 100,114, 120,124, fig. 3 numbers 164, 166 and 107, col. 3 lines 47-58, col. 5 lines 35-59.	1-6,8-11,13-16

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 January 2001 (22.01.2001)	19 APR 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer Keith Ferguson Telephone No. (703) 305-4888

Form PCT/ISA/210 (second sheet) (July 1998)